Missouri Department of Health and Senior Services

Hazardous Substances Emergency Events Surveillance (HSEES) Program

Methamphetamine Events Analysis 1999-2001

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EXECUTIVE SUMMARY

Since 1990, the federal Agency for Toxic Substances and Disease Registry (ATSDR) has maintained an active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences associated with the release of hazardous substances. Since 1993, the Missouri Department of Health and Senior Services (DHSS) has participated in this surveillance system.

During calendar year 2001, local, state and federal officials reported 2,130 seizures of methamphetamine labs, dumpsites and locations of inactive labs in Missouri – more than any other state in the nation. The prevalence of methamphetamine labs in the state, and the potential for injuries to responders and the general public related to these labs, demands that additional data be gathered regarding the public health impact of methamphetamine-related activities.

This report summarizes the characteristics of events related to methamphetamine which DHSS reported to the surveillance system during calendar years 1999-2001. The types of data collected included general information on the event, substance(s) released, number of victims, number and types of adverse health effects experienced by victims, and number of evacuations.

Several data sources were used to obtain notification and additional information regarding methamphetamine-related events. These sources included, but were not limited to, the Missouri State Highway Patrol (MSHP) Chemical Exposure Reports (beginning January 1, 2000); the United States Coast Guard's National Response Center (NRC); and the Missouri Department of Natural Resources (MDNR).

DHSS reported a total of 146 events related to methamphetamine for calendar years 1999-2001; 122 (83.6%) of the events occurred at fixed facilities, and 24 (16.4%) were transportation related. The most commonly reported categories of substances released were volatile organic compounds, ammonia and acids. During this reporting period, 129 events (88.4% of all reported methamphetamine events) resulted in a total of 193 victims. The adverse health effects most frequently experienced by victims were headache and respiratory system irritation. Two persons died as a result of methamphetamine events, and 11 events required evacuations.

Of the 146 events, 98 (67.1%) were related to the collection or processing of evidence from fixed methamphetamine labs; 29 (19.9%) were mobile methamphetamine labs or events involving the transport of substances to be used for methamphetamine production; and 19 (13.0%) were related to the theft of anhydrous ammonia, a common ingredient used in the process of "cooking" methamphetamine.

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)
Methamphetamine-Related Events, 1999-2001

INTRODUCTION

The surveillance system has four goals:

- To describe the distribution and characteristics of hazardous substances emergencies.
- To describe the morbidity and mortality experienced by employees, responders, and the general public as a result of hazardous substances releases.
- To identify risk factors associated with the morbidity and mortality.
- To identify strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

This report summarizes the characteristics of methamphetamine-related events and the associated public health consequences of these events reported by the Missouri HSEES program during calendar years 1999-2001.

METHODS

Releases are eligible for inclusion in the surveillance system if they are uncontrolled or illegal and require removal, cleanup, or neutralization according to federal, state, or local law. Threatened releases are also included in the system if 1) they involve actions (such as evacuations) that are taken to protect the public health, and 2) they would have required removal, cleanup, or neutralization according to federal, state, or local law. A substance is considered hazardous if it can be reasonably expected to cause adverse human health outcomes as a result of exposure.

In 1999, the Missouri HSEES program adopted ATSDR's recommendation to report all hazardous substance releases in which the quantity released was one-gallon/ten pounds or more. For substances with an Environmental Protection Agency (EPA) Reportable Quantity of one (1) pound or less, all releases are reported regardless of the quantity. All releases involving injuries and/or evacuations are also included. Releases to air and water that cannot be cleaned up are also included in the system if the amount released would need to be cleaned up if the spill had occurred on land. Events involving only petroleum products are excluded.

Additionally, events relating to methamphetamine were included in the HSEES system if one or more of the following criteria were met:

- One or more individuals had to be evacuated from the area due to actual or potential exposure to the substances used to produce methamphetamine
- One or more individuals suffered an adverse health effect from exposure to the substances used to produce methamphetamine

Various data sources were used to obtain notification about methamphetamine events. These sources included, but were not limited to, the Missouri Department of Natural Resources' (MDNR) Environmental Services Program, the United States Coast Guard's National Response Center (NRC), the Missouri State Highway Patrol (MSHP) and the media. Information collected for each event included:

- Date and time of occurrence
- Type of event (fixed-facility or transportation-related event)
- Causal factors
- Type of area in which the event occurred
- Substance(s) released
  - Substance name
  - Chemical form
  - Type of release (spill, air emission, fire, explosion)
  - Quantity released
- Victim(s)
  - Population group
  - Type of injury sustained
  - Severity
  - Demographics
  - Personnel protective equipment (PPE) worn
  - Distance from the release
- Evacuations
- Numbers of persons potentially affected (based on census data and working population)
- Public health activities initiated (environmental sampling, health advisory, health investigation)
- Response plans followed

Events captured by HSEES are classified according to whether they occur at fixed facilities or during transportation. Fixed-facility events involve hazardous substances released at industrial sites, schools, farms, or other permanent facilities; transportation-related events involve hazardous materials released during transport by surface, air, or water. Victims are defined as individuals with symptoms (including psychological

stress) or injuries (including death) that result from the event. Victims who receive more than one type of injury are counted once in each applicable type of injury.

Substances are grouped into 11 categories: acids, ammonia, bases, chlorine, mixtures, paints and dyes, pesticides, polychlorinated biphenyls, volatile organic compounds (VOCs), other inorganic substances, and other substances. The "mixtures" category consists of chemicals from different categories that are mixed before release, and the "other" category consists of chemicals that cannot be classified into any one of the other 10 chemical categories. The category "other inorganic substances" comprises all inorganic substances except acids, bases, ammonia, and chlorine.

INTERESTING EVENTS

Events involving methamphetamine production, including the theft of anhydrous ammonia, create dangerous situations that post significant risks to first responders and nearby residents. This section provides summaries of several events that were included in the surveillance system during this data analysis period.

- A police officer witnessed a person stealing anhydrous ammonia from a fertilizer supply company. He allowed the vehicle to leave the lot and attempted to make a traffic stop. During the pursuit, a passenger threw a one-gallon plastic jug of anhydrous ammonia out of the window. The jug landed in the front of the patrol car and a large white vapor cloud appeared. The officer swerved to avoid the cloud; however, the ammonia entered the vehicle through the vents, causing respiratory system irritation.

- Approximately 20 pounds of anhydrous ammonia were released inside a vehicle traveling on an interstate highway. Two individuals were in the vehicle and were transporting a container of anhydrous ammonia in an unapproved container. The container exploded inside the vehicle. The driver was seriously injured (minor external burns and serious inhalation injuries) and was hospitalized for seven days. The passenger (who was holding the canister inside a duffel bag) died four days later from severe external burns and inhalation injuries. One witness and two responders suffered respiratory irritation and inhalation burns. They were treated at a hospital but were not admitted. Both responders were wearing firefighter turn-out gear.

- Vandals opened a valve on an anhydrous ammonia nurse tank at 3:55 a.m. one morning. After stealing some of the ammonia, they fled the scene and left the valve open, releasing an estimated 150 gallons of ammonia. Police responded to a report of a strong odor and discovered a large vapor cloud hovering over the city's downtown district. Approximately 300 residents were evacuated from their homes for five hours while responders waited for the cloud to dissipate. Two members of the general public were treated at a hospital for respiratory irritation, and one firefighter was treated for skin irritation.

- A tank containing anhydrous ammonia ruptured and exploded in a mobile methamphetamine lab in the parking lot of a large discount store. A major portion of the parking lot was evacuated, as well as a convenience store in the vicinity, while responders flushed the area with water.

RESULTS

A total of 957 hazardous substances emergency events were reported to the HSEES system by DHSS during calendar years 1999-2001. Of these, 146 (15.3%) were related to methamphetamine. Two methamphetamine-related events were threatened releases and three were actual and threatened releases, with the remainder being actual releases. 83.6% (n=122) of the events occurred at fixed facilities, and 16.4% (n=24) were transportation-related events (Table 1). Table 2 shows the number of methamphetamine events by county and type of event, while Figure 1 shows total events by county in a geographic format.

Substances were considered either released or threatened to be released. Only one methamphetamine-related event was considered a threatened release. Of the remaining 145 events, 59 (40.7%) events involved the release of only one substance. Two substances were released in 33 (22.8%) events, and the remainder involved the release of more than two substances (Table 3).

A total of 312 substances were actually released. The number of substances released was greater than the number of events, since more than one substance could be included in a release. Most substances were released by air emissions (87.2%, n=272). The remaining substances were released during spills (1.9%, n=6) and explosions (1.0%, n=3), or a combination of two types of releases (9.9%, n=31).

Of the 40 events with a known time of occurrence, 12 (30.0%) occurred from 12:00 midnight to 6:00 a.m.; 15 (37.5%) occurred from 6:01 a.m. to 6:00 p.m.; and 13 (32.5%) occurred from 6:01 p.m. to 12:00 midnight. Of the 146 events reported, 25 (17.1%) occurred on a Saturday or Sunday.

SUBSTANCES RELEASED

The most frequently released substances included ammonia (26.0%, n=81), ethyl ether (21.5%, n=67) and hydrochloric acid (9.0%, n=28) (Table 4). The quantity released was known for only 17 (11.6%) of the 146 events. All 17 of these events involved ammonia. The amount of ammonia released ranged from 20 pounds to 13 tons. Of the 11 categories into which HSEES substances were grouped, the categories of substances most commonly released during methamphetamine-related events were volatile organic compounds (35.6%, n=111) and ammonia (26.0%, n=81) (Table 5).

VICTIMS

A total of 193 individuals (45.4% of the total victims for all HSEES events) suffered one or more adverse health effects during 129 (88.4%) of the 146 events related to methamphetamine (Table 6). Of the events with victims, 74.4% (n=96) involved only one victim, and 13.2% (n=17) involved two victims. Six events (4.7%) involved five or more victims. Of the total number of victims, 151 (78.2%) were injured during fixed facility events and 42 (21.8%) were injured in transportation events. Of the victims, 178 (92.2%) were responders and 15 (7.8%) were members of the general public. Of the 178 responders, 168 were police officers (Figure 2). The distribution of law enforcement victims by county is shown in Figure 3.

The majority of victims (81.9%, n=158) were reported by an official within 24 hours and the severity and treatment of the injuries is not known; however, 20 (10.4%) of the victims were treated at a hospital but were not admitted; 8 (4.1%) were treated on the scene; and 4 (2.1%) were transported to a hospital and admitted (Figure 4). One individual was treated by a private physician within 48 hours.

Two members of the general public died from chemical burns and respiratory distress during two separate methamphetamine-related events. In both events, the individuals involved were transporting anhydrous ammonia in unapproved canisters in a personal vehicle. The containers ruptured and released the ammonia inside the vehicles. In both events, responders and members of the general public were also injured while attempting to free occupants from involved vehicles.

The 193 victims sustained a total of 269 adverse health effects, as some victims had more than one injury/symptom. The most commonly reported injuries/symptoms in methamphetamine events were headache (42.0%, n=113) and respiratory system irritation (41.3%, n=111) (Figure 5).

The sex of 68 (35.2%) of the victims was known; of these, 63 (92.6%) were male. Among males, the majority were police officers (68.3%, n=43) and the general public (19.0%, n=12). Among the five females, three were members of the general public and two were volunteer firefighters.

Among the 178 responder victims, 12.4% (n=22) had not worn any form of personal protective equipment (PPE). The majority of these victims (n=20) were police officers. It was not known if PPE was worn for 14 responders. The most frequently worn PPE were gloves (63.4%, n=118), Level "C" protection (12.4%, n=23) and eye protection (10.8%, n=20).

EVACUATIONS

Evacuations were ordered in 11 (7.5%) of the 146 events resulting from methamphetamine-related activity. Six of the events involving an evacuation were the result of the theft of anhydrous ammonia, while five were due to methamphetamine labs.

The number of people evacuated was known in nine of these events. The total number of people evacuated in these nine events was 535. The median number of persons evacuated was 20 (range: 7 – 300). The length of evacuation was known for nine events. The median length of evacuation was 3 hours (range: 1 – 8).

SUMMARY OF RESULTS, HSEES METHAMPHETAMINE EVENTS, 1999-2001

The number of methamphetamine-related events by type, substances released, events with victims and deaths for the years 1999 through 2001 are shown in Table 7. Findings from HSEES data collection efforts provide useful information about risk factors related to emergency events and the associated public health impact. This information is used to develop prevention outreach activities, and is instrumental in developing state and local emergency response plans for accidental and intentional releases.

RECOMMENDATIONS

It is clear from the analyses of HSEES data collected for methamphetamine-related events during calendar years 1999-2001 that PPE worn by responders is inadequate and does not provide sufficient protection against adverse health effects. Additional PPE and increased awareness of the potential hazards of chemicals and processes used to produce methamphetamine are needed to reduce the adverse health effects resulting from these events. This is especially true in those areas of the state where the majority of law enforcement injuries are occurring.

The Missouri Department of Natural Resources (MDNR) and the Missouri State Highway Patrol (MSHP) co-sponsor a 40-hour course, "Clandestine Laboratory Investigation." This course is designed to provide participants with a thorough understanding of the chemicals and processes involved in methamphetamine production, and the appropriate guidelines to follow when entering a facility where methamphetamine-related activity is known or suspected. Upon completion of the course, each participant is offered nitrile gloves, NexGen coveralls, Saranex boot covers, and an Advantage 1000 respirator and cartridges. In addition, a Mine Safety Appliance (MSA) self-contained breathing apparatus (SCBA) is offered to all participants who qualify. Refresher courses are held annually. For additional information regarding these courses, contact the MDNR Environmental Services Program at (573) 526-3315 or the MSHP at (573) 751-3626.

Law enforcement personnel and other first responders are strongly encouraged to attend appropriate training for handling the substances used and produced during methamphetamine production. Appropriate PPE, as recommended during the course, should be worn any time the threat of exposure to hazardous substances exists. Refresher courses should be attended annually to maintain the level of awareness necessary to avoid adverse human health effects.

APPENDICES

Table 1.—Number of methamphetamine-related events meeting the surveillance definition, by year and type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

Year	Type of event				Total no. of events
	Fixed facility		Transportation		
	No. of events	%	No. of events	%	
1999	8	88.9	1	11.1	9
2000	68	82.9	14	17.1	82
2001	46	83.6	9	16.4	55
Total	122	83.6	24	16.4	146

Table 2. —Number of methamphetamine-related events meeting the surveillance definition, by county and type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

County	Type of event		Total no. of events
	Fixed facility No. of events	**Transportation** No. of events	
Barry	1	1	2
Bates	2	0	2
Benton	2	0	2
Butler	1	0	1
Callaway	4	1	5
Camden	1	0	1
Cape Girardeau	0	1	1
Cass	1	0	1
Christian	4	2	6
Clinton	1	0	1
Cole	4	0	4
Cooper	1	0	1
Crawford	4	0	4
Dade	2	0	2
Dallas	0	1	1
Dunklin	1	0	1
Franklin	6	0	6
Greene	5	2	7
Hickory	0	1	1
Howell	1	0	1
Jasper	6	3	9
Jefferson	5	2	7
Johnson	2	0	2
Lawrence	5	0	5
Lincoln	6	0	6
Macon	2	0	2
Madison	1	0	1
Miller	3	0	3
Monroe	2	0	2
Montgomery	2	1	3
Oregon	1	0	1
Osage	0	1	1

Table 2. —Number of methamphetamine-related events meeting the surveillance definition, by county and type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001. (continued)

County	Type of event		Total no. of events
	Fixed facility No. of events	**Transportation** No. of events	
Pettis	1	0	1
Phelps	1	1	2
Pike	1	0	1
Platte	1	0	1
Polk	3	1	4
Pulaski	1	0	1
Randolph	2	0	2
Scott	1	0	1
St. Charles	1	0	1
St. Clair	1	0	1
St. Francois	9	1	10
St. Louis	1	0	1
Ste. Genevieve	3	0	3
Stoddard	1	0	1
Stone	4	2	6
Taney	2	2	4
Texas	2	0	2
Vernon	3	0	3
Warren	1	0	1
Washington	5	0	5
Webster	2	1	3
TOTAL:	**122**	**24**	**146**

Figure 1.—Geographic distribution of methamphetamine-related events by county, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

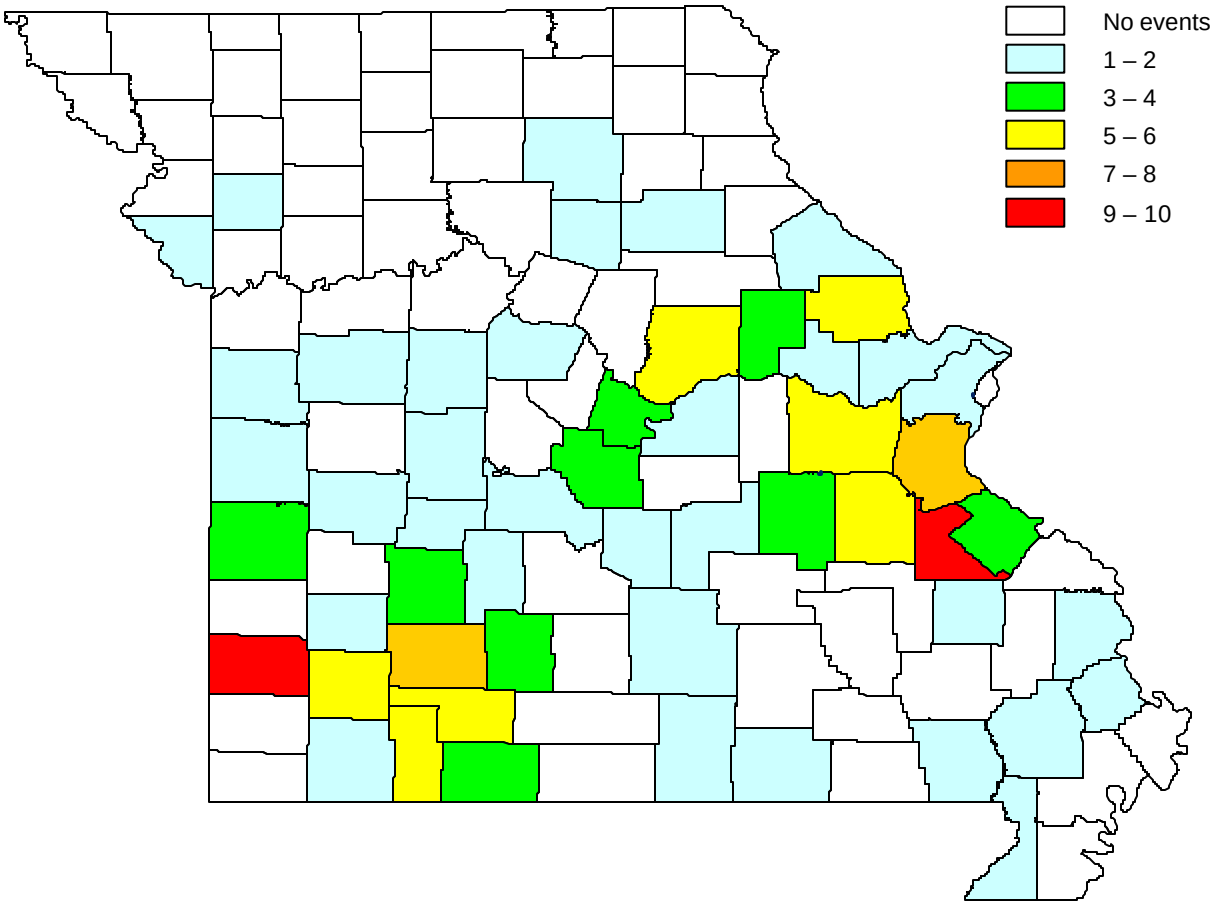

Table 3.—Distribution of the number of substances released during methamphetamine-related events, by type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001. *

No. of substances released	Type of event						All events		
	Fixed facility			Transportation					
	No. events	%	No. of substances	No. events	%	No. of substances	No. events	%	No. of substances
1	48	39.7	48	11	45.8	11	59	40.7	59
2	26	21.5	52	7	29.2	14	33	22.8	66
3	23	19.0	69	3	12.5	9	26	17.9	78
4	23	19.0	92	3	12.5	12	26	17.9	104
5	1	0.8	5	0	0.0	0	1	0.7	5
Total	121	100.0	266	24	100.0	46	145	100.0	312

Does not include substances that were threatened to be released during one event

Table 4—The 10 most frequently released substances in methamphetamine-related events, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

Number	Standardized Substance Name	Frequency	% of all meth releases (n=312)
1.	Ammonia	81	26.0
2.	Ethyl Ether	67	21.5
3.	Hydrochloric Acid	28	9.0
4.	Acid NOS	25	8.0
5.	Methamphetamine Chemicals NOS	18	5.8
6.	Acetone	15	4.8
7.	Phosphorus	14	4.5
8.	Iodine	14	4.5
9.	Alcohol NOS	12	3.8
10.	Solvent NOS	8	2.6
Total		284	91.0

NOS – Not Otherwise Specified

Table 5.—Distribution of the number of substances released during methamphetamine-related events, by substance category and type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

Substance category	Type of event				All events	
	Fixed facility		Transportation			
	No. of substances	(%)	No. of substances	(%)	No. of substances	(%)
Acids	52	19.5	6	13.0	58	18.6
Ammonia	74	27.8	7	15.2	81	26.0
Bases	2	0.8	1	2.2	3	1.0
Mixtures *	1	0.4	0	0.0	1	0.3
Other inorganic substances	26	9.8	6	13.0	32	10.3
Other substances	21	7.9	5	10.9	26	8.3
Volatile organic compounds	90	33.8	21	45.7	111	35.6
Total	266	100.0	46	100.0	312	100.1

* Mixtures of substances from different categories
*Total exceeds total number of events because events at which more than one substance was released were counted more than once.

Table 6.—Distribution of the number of victims for methamphetamine-related events, by type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

No. of victims	Type of event						All events		
	Fixed facility			Transportation					
	No. of events	(%)	No. of victims	No. of events	(%)	No. of victims	No. of events	(%)	No. of victims
1	79	75.2	79	17	70.8	17	96	74.4	96
2	16	15.2	32	1	4.2	2	17	13.2	34
3	5	4.8	15	3	12.5	9	8	6.2	24
4	1	1.0	4	1	4.2	4	2	1.6	8
5	3	2.9	15	2	8.3	10	5	3.9	25
6	1	1.0	6	0	0.0	0	1	0.8	6
Total	105	100.0	151	24	99.9	42	129	100.1	193

Figure 2. —Distribution of responder victims in methamphetamine-related events, by population group and type of event, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

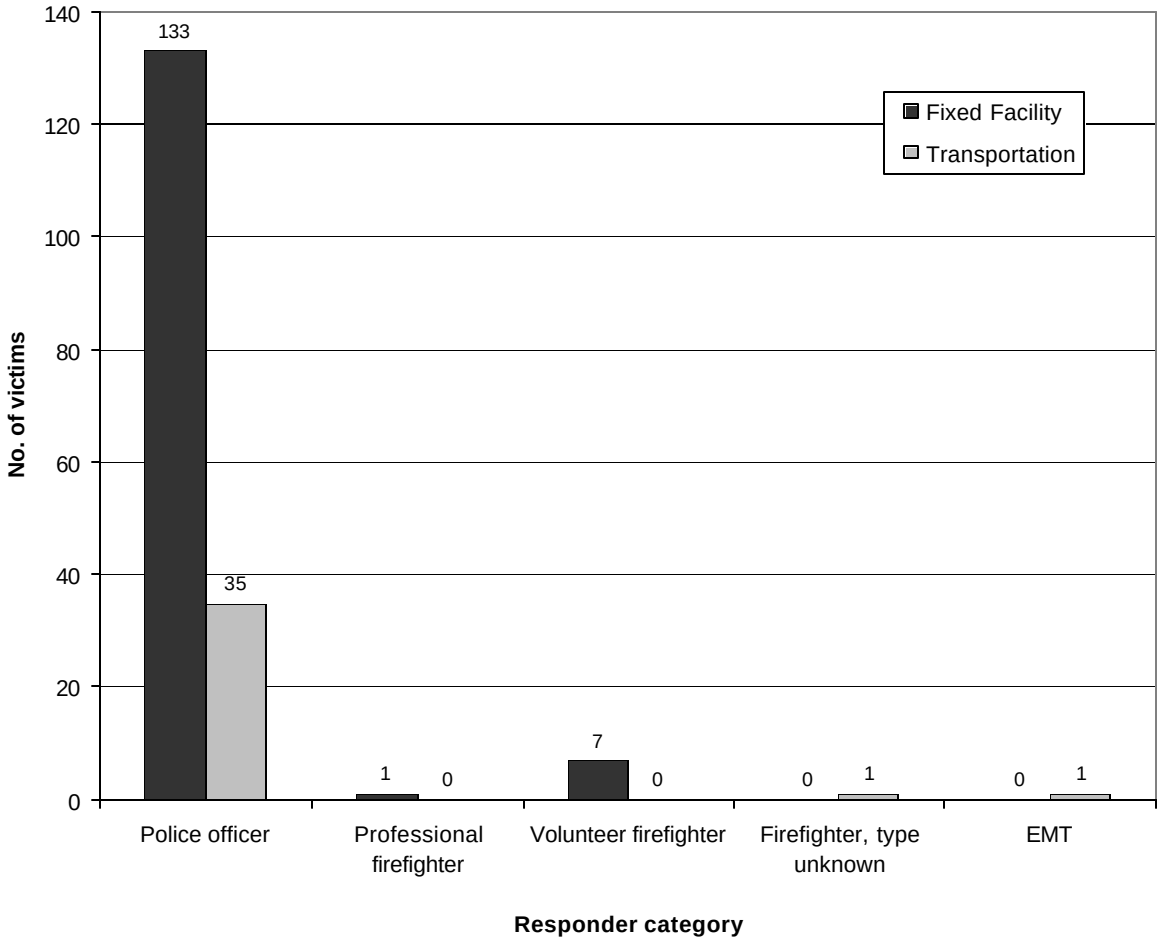

Figure 3. —Geographic distribution of law enforcement personnel injured during methamphetamine-related events, by county, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

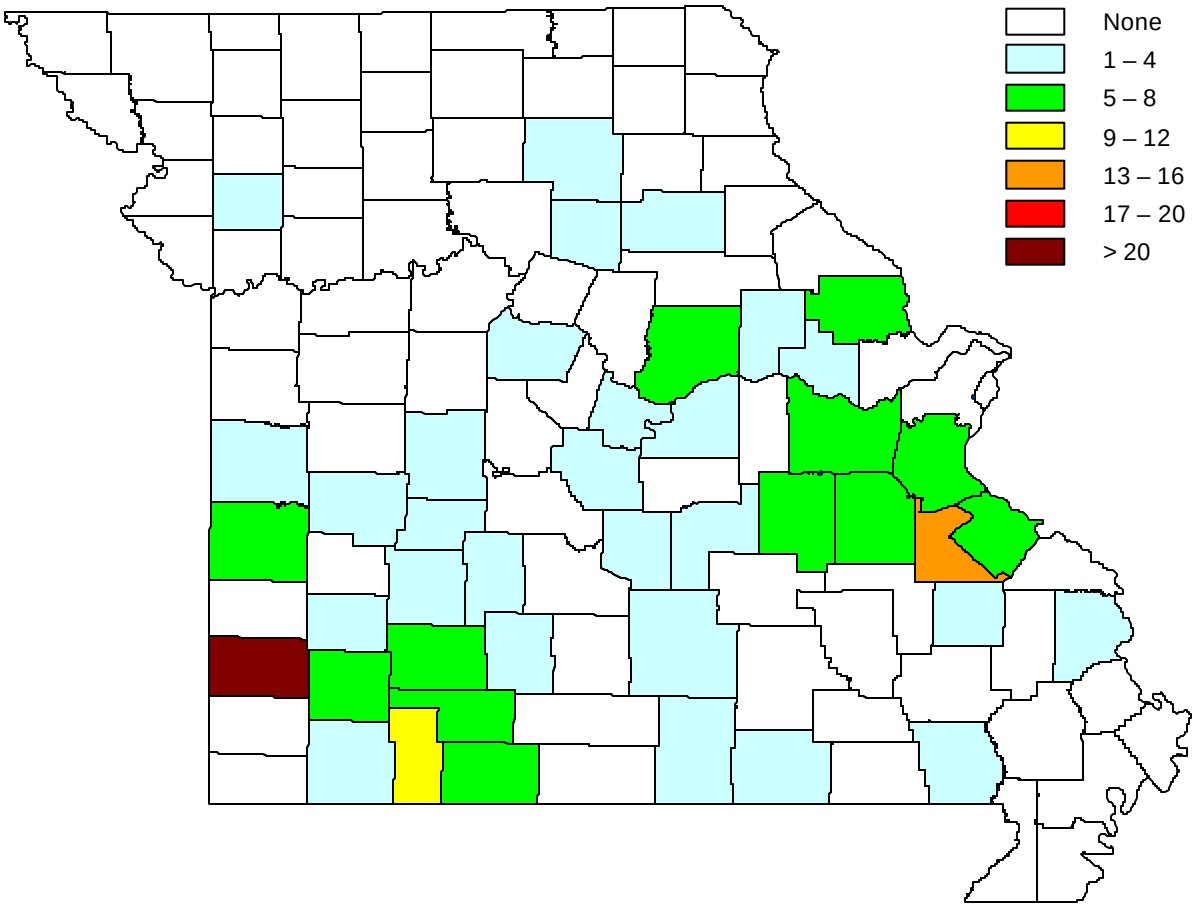

Figure 4. —Injury outcome, methamphetamine-related events, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

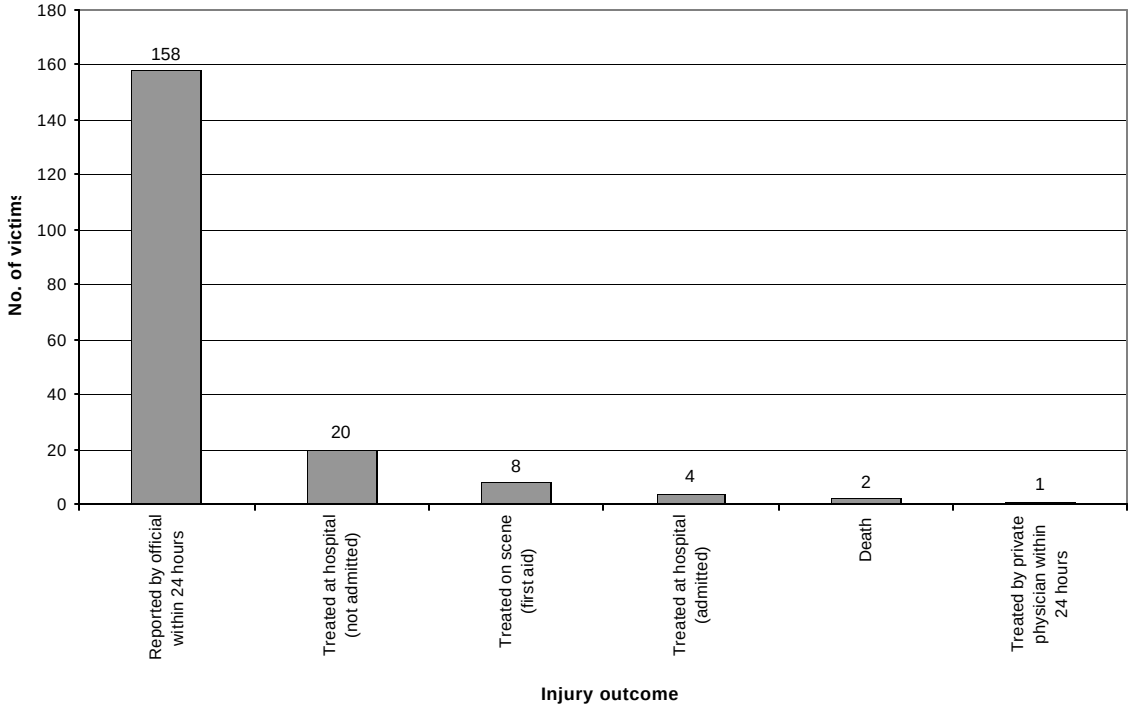

Figure 5. —Distribution of type of injury for all methamphetamine-related events, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

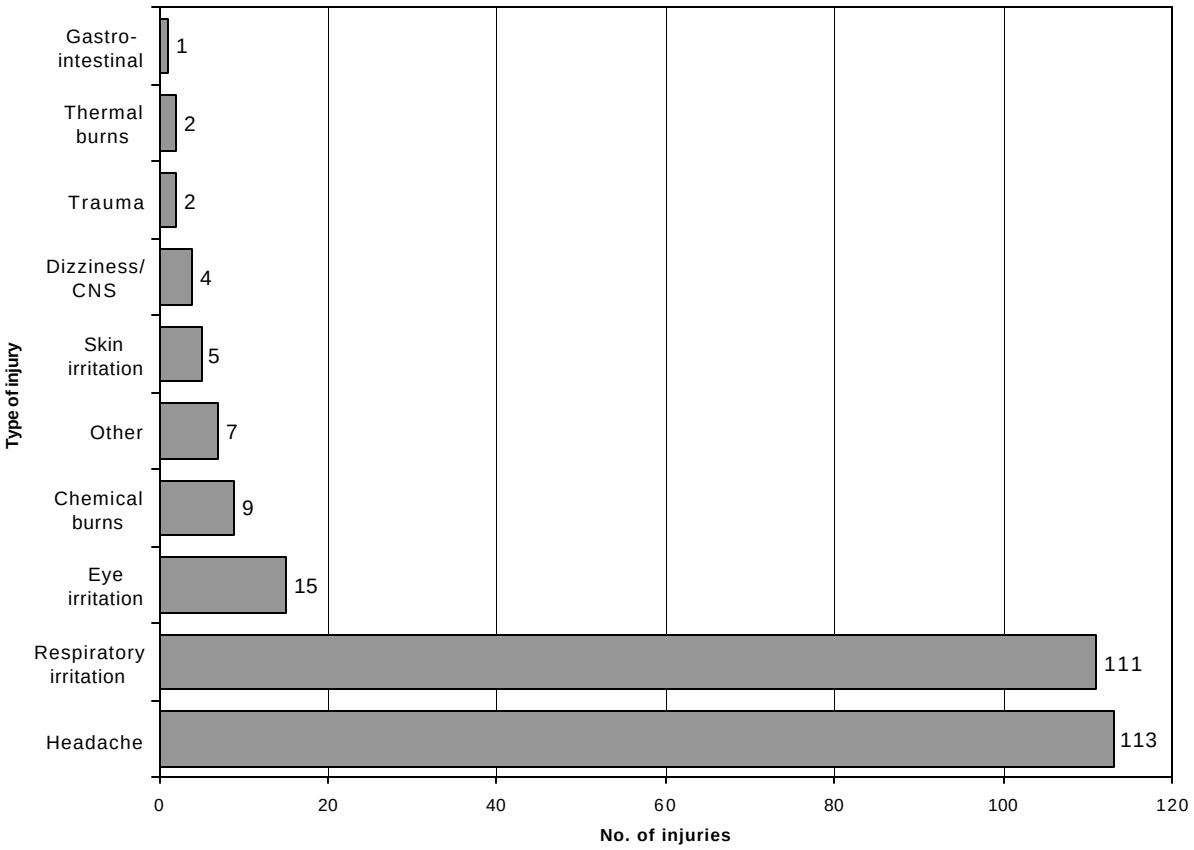

Table 7.—Summary data, methamphetamine-related events, Hazardous Substances Emergency Events Surveillance, Missouri, 1999-2001.

Year	Type of event			No. of substances released	No. of deaths	No. of victims	Events with victims	
	Fixed facility	Transport	Total				No.	%
1999	8	1	9	9	1	10	2	22.2
2000	68	14	82	189	0	110	78	95.1
2001	46	9	55	114	1	73	49	89.1
Total	122	24	146	312	2	193	129	88.4